

				LO1: Direct and indirect costs	LO2: DM, DL, Manuf. overhead	LO3: Period and product costs	LO4: Variable, fixed, and mixed costs	LO5: High-low method	LO6: Income statement formats	LO7: Decision-making cost classifications	LO8: Least squares regression (App 2A)	Professional exam adapted
				Question Type	Difficulty							
APP02A-Ref1 APP02A-Ref2 APP02A-Ref3	1	T/F	E								x	
	2	T/F	E								x	
	3	Conceptual M/C	E								x	
	4	Single Part M/C	H								x	
	5	Single Part M/C	H								x	
	6	Single Part M/C	H								x	
	7-11	Multipart M/C	M-H					x			x	
	12-13	Multipart M/C	M								x	
	14-15	Multipart M/C	M								x	
	16	Problem	H					x			x	
	17	Problem	H					x			x	
	18	Problem	H								x	
	19	Problem	H								x	
	20	Problem	H								x	
	21	Problem	H								x	

Least-Squares Regression Computations

True / False Questions

1. The R^2 (i.e., R-squared) is a measure of the goodness-of-fit in least-squares regression.

True False

2. When analyzing a mixed cost, you should always plot the data in a scattergraph, but it is particularly important to check the data visually on a scattergraph when the R^2 from a least squares regression is low. A quick look at the scattergraph can reveal that there is little relation between the cost and the activity or that the relation is something other than a simple straight line.

True False

Multiple Choice Questions

3. _____ is a method of separating a mixed cost into its fixed and variable elements by fitting a line to the data that minimizes the sum of the squared errors.

- A. Account analysis
- B. Scattergraph
- C. High-low
- D. Least-square regression

4. Your boss would like you to estimate the fixed and variable components of a particular cost. Actual data for this cost over four recent periods appear below.

	Activity	Cost
Period 1	24	\$174
Period 2	25	\$179
Period 3	20	\$165
Period 4	22	\$169

Using the least-squares regression method, what is the cost formula for this cost?

- A. $Y = \$0.00 + \$7.55X$
 B. $Y = \$110.44 + \$2.70X$
 C. $Y = \$103.38 + \$3.00X$
 D. $Y = \$113.35 + \$0.89X$
5. The management of Bandle Corporation would like for you to analyze their repair costs, which are listed below:

	Machine-Hours	Repair Costs
March	6,966	\$102,067
April	6,952	\$101,966
May	6,924	\$101,759
June	6,967	\$102,072
July	6,963	\$102,027
August	6,996	\$102,243
September	6,964	\$102,031
October	6,926	\$101,776

Management believes that repair cost is a mixed cost that depends on the number of machine-hours. Using the least-squares regression method, the estimates of the variable and fixed components of repair cost would be closest to:

- A. \$6.72 per machine-hour plus \$55,230 per month
 B. \$6.80 per machine-hour plus \$54,679 per month
 C. \$7.28 per machine-hour plus \$51,389 per month
 D. \$14.66 per machine-hour plus \$101,993 per month

6. Laborn Inc.'s inspection costs are listed below:

	Units Produced	Inspection Costs
March	265	\$11,254
April	248	\$10,684
May	272	\$11,516
June	235	\$10,210
July	207	\$9,258
August	217	\$9,578
September	261	\$11,108
October	274	\$11,578

Management believes that inspection cost is a mixed cost that depends on the number of units produced. Using the least-squares regression method, the estimates of the variable and fixed components of inspection cost would be closest to:

- A. \$43.04 per unit plus \$10,648 per month
- B. \$34.63 per unit plus \$2,089 per month
- C. \$34.78 per unit plus \$2,044 per month
- D. \$36.00 per unit plus \$1,714 per month

Donner Company would like to estimate the variable and fixed components of its maintenance costs and has compiled the following data for the last five months of operations.

	Labor Hours	Maintenance Cost
January	160	\$617
February	130	\$553
March	180	\$596
April	190	\$623
May	110	\$532

7. Using the high-low method of analysis, the estimated variable cost per labor hour for maintenance is closest to:
- A. \$0.83
 - B. \$1.84
 - C. \$1.30
 - D. \$1.14

8. Using the high-low method of analysis, the estimated total fixed cost per month for maintenance is closest to:
- A. \$440
 - B. \$407
 - C. \$470
 - D. \$0
9. Using the least-squares regression method, the estimated variable cost per labor hour for maintenance is closest to:
- A. \$1.88
 - B. \$1.52
 - C. \$1.09
 - D. \$1.96
10. Using the least-squares regression method, the estimated total fixed cost per month for maintenance is closest to:
- A. \$470
 - B. \$416
 - C. \$400
 - D. \$378
11. Using the least-squares regression equation, the total maintenance cost for March is:
- A. above the regression line.
 - B. on the regression line.
 - C. below the regression line.
 - D. outside the relevant range.

Recent maintenance costs of Gallander Corporation are listed below:

	Machine-Hours	Maintenance Costs
April	727	\$7,269
May	725	\$7,290
June	720	\$7,273
July	641	\$7,130
August	671	\$7,208
September	728	\$7,291
October	710	\$7,260
November	707	\$7,231

Management believes that maintenance cost is a mixed cost that depends on machine-hours.

12. Using the least-squares regression method, the estimate of the variable component of maintenance cost per machine-hour is closest to:
- A. \$1.85
 - B. \$10.30
 - C. \$1.67
 - D. \$1.90
13. Using the least-squares regression method, the estimate of the fixed component of maintenance cost per month is closest to:
- A. \$6,066
 - B. \$7,244
 - C. \$5,944
 - D. \$7,130

Cespedes Inc.'s inspection costs are listed below:

	Units Produced	Inspection Costs
March	659	\$10,550
April	628	\$10,380
May	643	\$10,462
June	678	\$10,655
July	622	\$10,342
August	656	\$10,531
September	694	\$10,731
October	662	\$10,566

Management believes that inspection cost is a mixed cost that depends on units produced.

14. Using the least-squares regression method, the estimate of the variable component of inspection cost per unit produced is closest to:
- A. \$5.40
 - B. \$5.33
 - C. \$5.43
 - D. \$16.07
15. Using the least-squares regression method, the estimate of the fixed component of inspection cost per month is closest to:
- A. \$6,983
 - B. \$10,342
 - C. \$10,527
 - D. \$6,972

Essay Questions

16. CPE for CPAs, Inc., provides continuing professional education for certified public accountants. The company is relatively new and management is seeking information regarding the company's cost structure. The following information has been gathered for the first six months of the current year:

	Seminars Offered	Costs Incurred
January	8	\$15,200
February	10	\$17,000
March	13	\$19,400
April	16	\$21,800
May	14	\$20,000
June	11	\$18,200

Required:

- Using the high-low method, estimate the variable cost per seminar and the total fixed cost per month.
- Using the least-squares regression method, estimate the variable cost per seminar and the total fixed cost per month.

17. The management of Buff Sports Stadium believes that the number of sporting events each month is an measure of activity for total clean-up cost. Shown below are event figures and total clean up costs for the past four months:

	Number of Sporting Events	Total Clean-up Cost
July.....	28	\$30,900
August	34	\$34,200
September	16	\$20,700
October.....	22	\$28,200

Required:

- Estimate Buff's cost formula for monthly clean-up cost using the high-low method.
- Estimate Buff's cost formula for monthly clean-up cost using the least-squares regression method.

18. Sablan Inc. maintains a call center to take orders, answer questions, and handle complaints. The costs of the call center for a number of recent months are listed below:

	Calls Taken	Call Center Cost
January	3,893	\$96,896
February	3,856	\$96,675
March	3,827	\$96,519
April	3,892	\$96,880
May	3,867	\$96,730
June	3,874	\$96,783
July	3,881	\$96,797
August	3,877	\$96,780

Management believes that the cost of the call center is a mixed cost that depends on the number of calls taken.

Required:

Estimate the variable cost per call and fixed cost per month using the least-squares regression method.

19. Below are cost and activity data for a particular cost over the last four periods. Your boss has asked you to analyze this cost so that management will have a better understanding of how this cost changes in response to changes in activity.

	Activity	Cost
Period 1	44	\$277
Period 2	42	\$265
Period 3	48	\$284
Period 4	49	\$284

Required:

Using the least-squares regression method, estimate the cost formula for this cost.

20. Escalona Printing Corp., a book printer, has provided the following data:

	Titles Printed	Press Setup Cost
February	20	\$3,405
March	31	\$4,277
April	18	\$3,281
May	28	\$4,040
June	34	\$4,535
July	22	\$3,561
August	33	\$4,451
September	23	\$3,637

Management believes that the press setup cost is a mixed cost that depends on the number of titles printed. (A specific book that is to be printed is called a "title". Typically, thousands of copies will be printed of each title. Specific steps must be taken to setup the presses for printing each title-for example, changing the printing plates. The costs of these steps are the press setup costs.)

Required:

Estimate the variable cost per title printed and the fixed cost per month using the least-squares regression method.

21. The management of Sambrano Corporation would like to better understand the behavior of the company's warranty costs. Those costs are listed below for a number of recent months:

	Product Returns	Warranty Cost
January	17	\$4,106
February	28	\$4,560
March	21	\$4,280
April	24	\$4,399
May	27	\$4,528
June	20	\$4,239
July	18	\$4,144
August	30	\$4,642

Management believes that warranty cost is a mixed cost that depends on the number of product returns.

Required:

Estimate the variable cost per product return and the fixed cost per month using the least-squares regression method.

Appendix 02A Least-Squares Regression Computations **Answer Key**

True / False Questions

1. The R^2 (i.e., R-squared) is a measure of the goodness-of-fit in least-squares regression.

TRUE

AACSB: Reflective Thinking

AICPA BB: Critical Thinking

AICPA FN: Measurement

Blooms: Remember

Difficulty: 1 Easy

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

2. When analyzing a mixed cost, you should always plot the data in a scattergraph, but it is particularly important to check the data visually on a scattergraph when the R^2 from a least squares regression is low. A quick look at the scattergraph can reveal that there is little relation between the cost and the activity or that the relation is something other than a simple straight line.

TRUE

AACSB: Reflective Thinking

AICPA BB: Critical Thinking

AICPA FN: Measurement

Blooms: Remember

Difficulty: 1 Easy

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

Multiple Choice Questions

3. _____ is a method of separating a mixed cost into its fixed and variable elements by fitting a line to the data that minimizes the sum of the squared errors.

- A. Account analysis
- B. Scattergraph
- C. High-low
- D. Least-square regression**

AACSB: Reflective Thinking

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

4. Your boss would like you to estimate the fixed and variable components of a particular cost. Actual data for this cost over four recent periods appear below.

	Activity	Cost
Period 1	24	\$174
Period 2	25	\$179
Period 3	20	\$165
Period 4	22	\$169

Using the least-squares regression method, what is the cost formula for this cost?

- A. $Y = \$0.00 + \$7.55X$
B. $Y = \$110.44 + \$2.70X$
C. $Y = \$103.38 + \$3.00X$
D. $Y = \$113.35 + \$0.89X$

Using Microsoft Excel, the slope and intercept are:

Intercept	\$110.44	Fixed cost
Slope.....	\$2.70	Variable cost
RSQ.....	0.967	

Therefore, the cost formula is \$110.44 per activity plus \$2.70 per unit or:

$$Y = \$110.44 + \$2.70X$$

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

5. The management of Bandle Corporation would like for you to analyze their repair costs, which are listed below:

	Machine-Hours	Repair Costs
March	6,966	\$102,067
April	6,952	\$101,966
May	6,924	\$101,759
June	6,967	\$102,072
July	6,963	\$102,027
August	6,996	\$102,243
September	6,964	\$102,031
October	6,926	\$101,776

Management believes that repair cost is a mixed cost that depends on the number of machine-hours. Using the least-squares regression method, the estimates of the variable and fixed components of repair cost would be closest to:

- A. \$6.72 per machine-hour plus \$55,230 per month
- B. \$6.80 per machine-hour plus \$54,679 per month**
- C. \$7.28 per machine-hour plus \$51,389 per month
- D. \$14.66 per machine-hour plus \$101,993 per month

Using Microsoft Excel, the solution is:

Intercept	\$54,679	Fixed cost
Slope	\$6.80	Variable cost
RSQ	0.9956	

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 3 Hard

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

6. Laborn Inc.'s inspection costs are listed below:

	Units Produced	Inspection Costs
March	265	\$11,254
April	248	\$10,684
May	272	\$11,516
June	235	\$10,210
July	207	\$9,258
August	217	\$9,578
September	261	\$11,108
October	274	\$11,578

Management believes that inspection cost is a mixed cost that depends on the number of units produced. Using the least-squares regression method, the estimates of the variable and fixed components of inspection cost would be closest to:

- A. \$43.04 per unit plus \$10,648 per month
- B. \$34.63 per unit plus \$2,089 per month
- C. \$34.78 per unit plus \$2,044 per month**
- D. \$36.00 per unit plus \$1,714 per month

Using Microsoft Excel, the solution is:

Intercept	\$2,044	Fixed cost
Slope	\$34.78	Variable cost
RSQ	1.00	

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 3 Hard

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

Donner Company would like to estimate the variable and fixed components of its maintenance costs and has compiled the following data for the last five months of operations.

	Labor Hours	Maintenance Cost
January	160	\$617
February	130	\$553
March	180	\$596
April	190	\$623
May	110	\$532

7. Using the high-low method of analysis, the estimated variable cost per labor hour for maintenance is closest to:
- A. \$0.83
 - B. \$1.84
 - C. \$1.30
 - D. \$1.14**

	Labor Hours	Maintenance Cost
High activity level (April)	190	\$623
Low activity level (May)	110	\$532
Change	80	\$91

Variable cost = Change in cost ÷ Change in activity = \$91 ÷ 80 labor hours = \$1.1375 per labor hour

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02-05 Analyze a mixed cost using a scattergraph plot and the high-low method.

8. Using the high-low method of analysis, the estimated total fixed cost per month for maintenance is closest to:
- A. \$440
 - B. \$407**
 - C. \$470
 - D. \$0

	Labor Hours	Maintenance Cost
High activity level (April)	190	\$623
Low activity level (May)	110	\$532
Change	80	\$91

Variable cost = Change in cost ÷ Change in activity = \$91 ÷ 80 labor hours = \$1.1375 per labor hour

Fixed cost = Total cost - Variable cost

Fixed cost = \$623 - (\$1.1375 per labor hour × 190 labor hours) = \$406.875

AACSB: Analytic
AICPA BB: Critical Thinking

AICPA FN: Measurement

Blooms: Apply

Difficulty: 2 Medium

Learning Objective: 02-05 Analyze a mixed cost using a scattergraph plot and the high-low method.

9. Using the least-squares regression method, the estimated variable cost per labor hour for maintenance is closest to:
- A. \$1.88
 - B. \$1.52
 - C. \$1.09**
 - D. \$1.96

The regression line is $Y = 415.69 + 1.0942X$ and the R^2 is 0.8432

Therefore, the variable cost per labor hour for maintenance is closest to \$1.09.

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Blooms: Apply

Difficulty: 3 Hard

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

10. Using the least-squares regression method, the estimated total fixed cost per month for maintenance is closest to:
- A. \$470
 - B. \$416**
 - C. \$400
 - D. \$378

The regression line is $Y = 415.69 + 1.0942X$ and the R^2 is 0.8432

Therefore, the fixed cost for maintenance is closest to \$416.

AACSB: Analytic

AICPA BB: Critical Thinking

AICPA FN: Measurement

Blooms: Apply

Difficulty: 3 Hard

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

11. Using the least-squares regression equation, the total maintenance cost for March is:

- A. above the regression line.
- B. on the regression line.
- C. below the regression line.**
- D. outside the relevant range.

The regression line is $Y = 415.69 + 1.0942X$. In March, X is 180 and therefore Y is:
 $Y = 415.69 + (1.0942 \times 180) = \612.646 . The actual maintenance cost for March was \$596, which is less than \$612.646. Therefore, the total maintenance cost for March is below the regression line.

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 3 Hard

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

Recent maintenance costs of Gallander Corporation are listed below:

	Machine-Hours	Maintenance Costs
April	727	\$7,269
May	725	\$7,290
June	720	\$7,273
July	641	\$7,130
August	671	\$7,208
September	728	\$7,291
October	710	\$7,260
November	707	\$7,231

Management believes that maintenance cost is a mixed cost that depends on machine-hours.

12. Using the least-squares regression method, the estimate of the variable component of maintenance cost per machine-hour is closest to:

- A. \$1.85
- B. \$10.30
- C. \$1.67**
- D. \$1.90

Using Microsoft Excel functions, the solution is:
Maintenance cost per machine-hour = Slope = \$1.67

AACSB: Analytic

AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

13. Using the least-squares regression method, the estimate of the fixed component of maintenance cost per month is closest to:

- A. \$6,066
- B. \$7,244
- C. \$5,944
- D. \$7,130

Using Microsoft Excel functions, the solution is:

Fixed maintenance cost per month = Intercept = \$6,066

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

Cespedes Inc.'s inspection costs are listed below:

	Units Produced	Inspection Costs
March	659	\$10,550
April	628	\$10,380
May	643	\$10,462
June	678	\$10,655
July	622	\$10,342
August	656	\$10,531
September	694	\$10,731
October	662	\$10,566

Management believes that inspection cost is a mixed cost that depends on units produced.

14. Using the least-squares regression method, the estimate of the variable component of inspection cost per unit produced is closest to:
- A. \$5.40
 - B. \$5.33
 - C. \$5.43**
 - D. \$16.07

Using Microsoft Excel functions, the solution is:
Variable cost per unit produced = Slope = \$5.43

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

15. Using the least-squares regression method, the estimate of the fixed component of inspection cost per month is closest to:
- A. \$6,983
 - B. \$10,342
 - C. \$10,527
 - D. \$6,972**

Using Microsoft Excel functions, the solution is:
Fixed cost per month = Intercept = \$6,972

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 2 Medium

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

Essay Questions

16. CPE for CPAs, Inc., provides continuing professional education for certified public accountants. The company is relatively new and management is seeking information regarding the company's cost structure. The following information has been gathered for the first six months of the current year:

	Seminars Offered	Costs Incurred
January.....	8	\$15,200
February	10	\$17,000
March	13	\$19,400
April.....	16	\$21,800
May	14	\$20,000
June	11	\$18,200

Required:

- Using the high-low method, estimate the variable cost per seminar and the total fixed cost per month.
- Using the least-squares regression method, estimate the variable cost per seminar and the total fixed cost per month.

a. High-Low Method

	Seminars Offered	Cost Incurred
High activity level (April)	16	\$21,800
Low activity level (January).....	8	15,200
Change	8	\$6,600

Variable cost = Change in cost ÷ Change in activity

Variable cost = \$6,600 ÷ 8 seminars = \$825 per seminar

Fixed cost = Total cost - Variable cost

Fixed cost = \$21,800 - (16 seminars × \$825 per seminar) = \$8,600

Y = \$8,600 + \$825X

b. Least-squares regression method

Using Microsoft Excel functions, the estimates are:

Variable cost per seminar = Slope = \$9,000

Total fixed cost per month = Intercept = \$800

Y = \$9,000 + \$800X

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 3 Hard

Learning Objective: 02-05 Analyze a mixed cost using a scattergraph plot and the high-low method.

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

17. The management of Buff Sports Stadium believes that the number of sporting events each month is an measure of activity for total clean-up cost. Shown below are event figures and total clean up costs for the past four months:

	Number of Sporting Events	Total Clean-up Cost
July	28	\$30,900
August	34	\$34,200
September	16	\$20,700
October	22	\$28,200

Required:

- Estimate Buff's cost formula for monthly clean-up cost using the high-low method.
- Estimate Buff's cost formula for monthly clean-up cost using the least-squares regression method.

a.

	Number of Sporting Events	Total Clean- Up Cost
High activity level (August)	34	\$34,200
Low activity level (September)	16	\$20,700
Change	18	\$13,500

Variable cost = Change in cost ÷ Change in activity

Variable cost = \$13,500 ÷ 18 events = \$750 per event

Fixed cost = Total cost - Variable cost

Fixed cost = \$34,200 - (\$750 per event × 34 events) = \$8,700

$Y = \$8,700 + \$750X$

b. Least-squares regression method

Using Microsoft Excel functions, the estimates are:

Variable cost per seminar = Slope = \$720

Total fixed cost per month = Intercept = \$10,500

$Y = \$10,500 + \$720X$

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 3 Hard

Learning Objective: 02-05 Analyze a mixed cost using a scattergraph plot and the high-low method.
Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

18. Sablan Inc. maintains a call center to take orders, answer questions, and handle complaints. The costs of the call center for a number of recent months are listed below:

	Calls Taken	Call Center Cost
January	3,893	\$96,896
February	3,856	\$96,675
March	3,827	\$96,519
April	3,892	\$96,880
May	3,867	\$96,730
June	3,874	\$96,783
July	3,881	\$96,797
August	3,877	\$96,780

Management believes that the cost of the call center is a mixed cost that depends on the number of calls taken.

Required:

Estimate the variable cost per call and fixed cost per month using the least-squares regression method.

Using Microsoft Excel functions, the solution is:

Variable cost per call = Slope = \$5.56

Fixed cost per month = Intercept = \$75,218

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 3 Hard

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

19. Below are cost and activity data for a particular cost over the last four periods. Your boss has asked you to analyze this cost so that management will have a better understanding of how this cost changes in response to changes in activity.

	Activity	Cost
Period 1	44	\$277
Period 2	42	\$265
Period 3	48	\$284
Period 4	49	\$284

Required:

Using the least-squares regression method, estimate the cost formula for this cost.

The solution using Microsoft Excel functions is:

Variable cost = Slope = \$2.55

Fixed cost = Intercept = \$160.85

Therefore, the cost formula is \$160.85 per period plus \$2.55 per unit of activity or:

$$Y = \$160.85 + \$2.55X$$

The solution using the formulas in the text is:

$$n = 4$$

$$\text{sum}X = 183$$

$$\text{sum}Y = 1,110$$

$$\text{sum}XY = 50,866$$

$$\text{sum}X^2 = 8,405$$

$$\begin{aligned} b &= [n(\text{sum}XY) - (\text{sum}X)(\text{sum}Y)]/[n(\text{sum}X^2) - (\text{sum}X)^2] \\ &= [4(50,866) - (183)(1,110)]/[4(8,405) - (183)^2] \\ &= \$2.55 \text{ (rounded to nearest whole cent)} \end{aligned}$$

$$\begin{aligned} a &= [(\text{sum}Y) - b(\text{sum}X)]/n \\ &= [(1,110) - 2.55(183)]/4 \\ &= \$161 \text{ (rounded to nearest whole dollar)} \end{aligned}$$

Cost formula: $Y = \$161 + \$2.55X$.

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 3 Hard

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

20. Escalona Printing Corp., a book printer, has provided the following data:

	Titles Printed	Press Setup Cost
February	20	\$3,405
March	31	\$4,277
April	18	\$3,281
May	28	\$4,040
June	34	\$4,535
July	22	\$3,561
August	33	\$4,451
September	23	\$3,637

Management believes that the press setup cost is a mixed cost that depends on the number of titles printed. (A specific book that is to be printed is called a "title". Typically, thousands of copies will be printed of each title. Specific steps must be taken to setup the presses for printing each title—for example, changing the printing plates. The costs of these steps are the press setup costs.)

Required:

Estimate the variable cost per title printed and the fixed cost per month using the least-squares regression method.

The solution using Microsoft Excel functions is:

Variable cost per title printed = Slope = \$79.33

Fixed cost per month = Intercept = \$1,826

The solution using the formulas in the text is:

$$n = 8$$

$$\text{sum}X = 209$$

$$\text{sum}Y = \$31,187$$

$$\text{sum}XY = \$835,931$$

$$\text{sum}X^2 = 5,727$$

$$\begin{aligned} b &= [n(\text{sum}XY) - (\text{sum}X)(\text{sum}Y)]/[n(\text{sum}X^2) - (\text{sum}X)^2] \\ &= [8(\$835,931) - (209)(\$31,187)]/[8(5,727) - (209)^2] \\ &= \$79.33 \end{aligned}$$

$$\begin{aligned} a &= [(\text{sum}Y) - b(\text{sum}X)]/n \\ &= [(\$31,187) - \$79.33(209)]/8 \\ &= \$1,826 \end{aligned}$$

Any difference in the solutions is due to rounding errors when the formulas are used.

AACSB: Analytic
AICPA BB: Critical Thinking

AICPA FN: Measurement

Blooms: Apply

Difficulty: 3 Hard

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.

21. The management of Sambrano Corporation would like to better understand the behavior of the company's warranty costs. Those costs are listed below for a number of recent months:

	Product Returns	Warranty Cost
January.....	17	\$4,106
February	28	\$4,560
March	21	\$4,280
April	24	\$4,399
May	27	\$4,528
June	20	\$4,239
July.....	18	\$4,144
August	30	\$4,642

Management believes that warranty cost is a mixed cost that depends on the number of product returns.

Required:

Estimate the variable cost per product return and the fixed cost per month using the least-squares regression method.

The solution using Microsoft Excel functions is:

Variable cost per product return = Slope = \$41.30

Fixed cost per month = Intercept = \$3,407

The solution using the formulas in the text is:

$$n = 8$$

$$\text{sum}X = 185$$

$$\text{sum}Y = \$34,898$$

$$\text{sum}XY = \$813,826$$

$$\text{sum}X^2 = 4,443$$

$$\begin{aligned} b &= [n(\text{sum}XY) - (\text{sum}X)(\text{sum}Y)]/[n(\text{sum}X^2) - (\text{sum}X)^2] \\ &= [8(\$813,826) - (185)(\$34,898)]/[8(4,443) - (185)^2] \\ &= \$41.30 \end{aligned}$$

$$\begin{aligned} a &= [(\text{sum}Y) - b(\text{sum}X)]/n \\ &= [(\$34,898) - \$41.30(185)]/8 \\ &= \$3,407 \end{aligned}$$

Any difference in the solutions is due to rounding errors when the formulas are used.

AACSB: Analytic
AICPA BB: Critical Thinking
AICPA FN: Measurement
Blooms: Apply
Difficulty: 3 Hard

Learning Objective: 02A-08 Analyze a mixed cost using a scattergraph plot and the least-squares regression method.